Electric on-board starter

FEMA

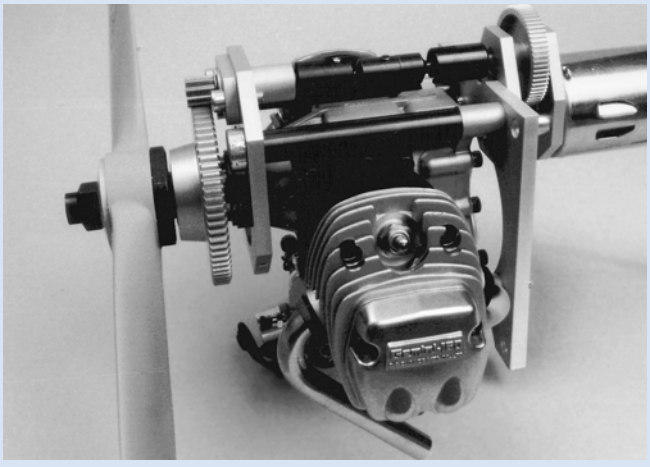
With the FEMA on-board starting system a dream of many innovative model makers has come true.

Functional description:
With the FEMA on-board starting systems all common internal combustion engines can be started safely by radio control on ground as well as in the air. For the universal use there are two different variations of on-board starting systems:

Universal on-board starting system

For this model, only the starting device is attached directly to the internal combustion engine. The starter engine is placed separately from the internal combustion engine inside the fuselage (depending on balance point or space requirements). The power from the starter engine to the starting device at the internal combustion engine is transmitted via a cardan shaft with variable length.

Compact on-board starting system



Different to the universal on-board starting system, the starting device and the starter engine of the compact on-board starter are attached directly to the internal combustion engine. Thus the internal combustion engine and the on-board starter form a compact unit.

The on-board starting systems can basically be deployed in two operation modes:

Starting of the internal combustion engine via the radio control
With this operation mode, the internal combustion engine can be started on the ground as well as in the air via the radio control. In this case the NC-storage battery is placed inside the model.

Safe starting of the internal combustion engine is only possible on ground
This operating mode only requires the attachment of the starting device and the starter engine inside the model. The starter storage battery (glow plug engines additionally require a plug heater) is placed in a starting box. The on-board starter is manually switched on and off via micro switches.

Control of electric on-board starting systems
The electric on-board starter is controlled via micro switches operated from an IC-servo. For the secure starting of the internal combustion engine it is necessary that the starter engine starts at the activation of the engine immediately with full power to prevent the kick-back of the combustion engine. (Please do not use electric controllers)
For glow plug engines you also need a plug warmer (stock number 9593 B) which is switched on and off directly by the receiver via a channel or mixer.
Current supply of the electric on-board starter
The current supply of the starter engine and of the heater plug only requires a starter storage battery to which also the electric plug warmer is connected.

Recommendation for starting storage batteries
For starting storage battery you have to use high-amperage (16 A) NC, NiMh or LiPo batteries that are also deployed in electric flying model aircrafts. Every kit contains detailed assembly instructions and a manual for the trouble-free assembly of your electric on-board starting system.

If you don't find a suitable on-board starter for your internal combustion engine in our product range, please contact us. Due to the modular design of the on-board starting systems we can assemble an individual on-board starter for you.

We hope you will enjoy your hobby with our on-board starting systems!

Universal on-board starter

FEMA

figure I

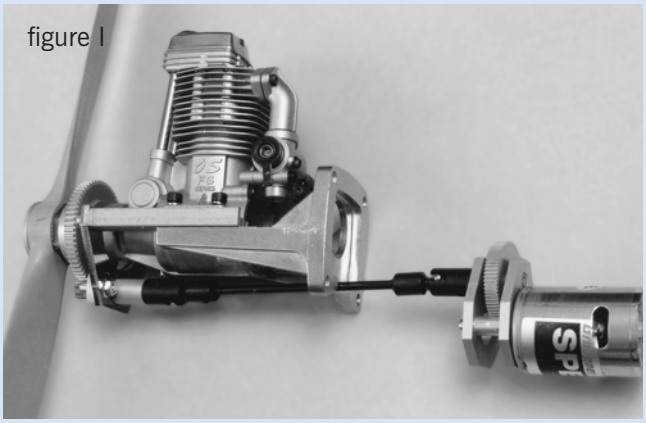
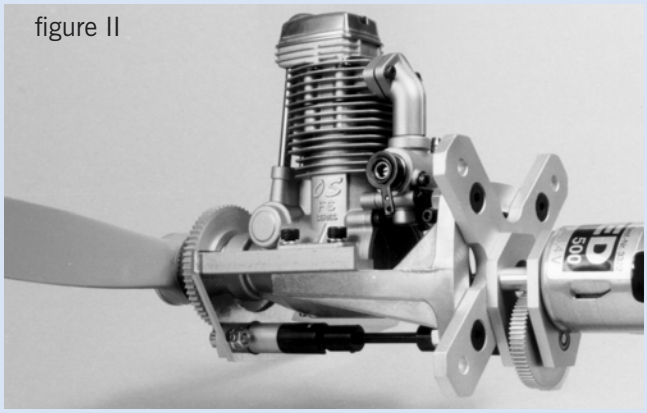


figure II



Stock number 9500 Basic kit for 7.5-14 ccm engines
Stock number 9512 Basic kit for 15-35 ccm engines
Stock number 9514 Complete kit for OS-Max BGX-1, OS-Max 160 FX, Moki-25, Magnum XL180AR, Laser 200, MVVS-35 (Glow)

The universal on-board starting system of figure I for aircraft engines can be attached to all common single cylinder glow plug engines. In addition to the basic kit each motor type requires an adapter kit. The complete set contains the adapter set for the respective motor type.

For the operation of the glow plug you also need the plug warmer (stock number 9593B) which is not included in the kit.

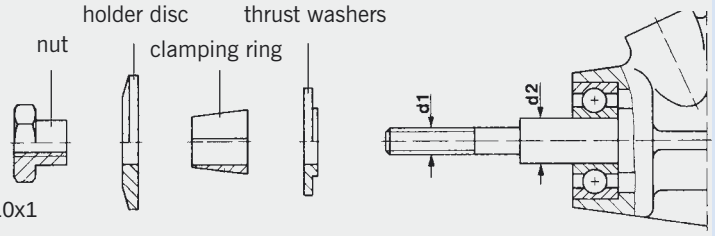
If you use the plug warmer you only require one storage battery for the operation of the on-board starter from which the starter engine and the glow plug are fed.
The basic kit and the complete kit include all mechanical and electric components that are necessary for the operation of the on-board starter. The universal on-board starting system can also be attached as a compact version (see figure II). The holder plate is not included in the delivery, you can build it on your own.

Adapters for 7.5 - 35cc aircraft and naval engines*

In addition to the basic kit, an adapter is necessary for each engine type. Adapters can be combined individually for internal combustion engines that are not listed above. Please specify with your order thread = d1 and diameter = d2

Available clamping rings and thrust washers:
d2: 6.0, 7.0, 8.0, 9.5, 10, 12(mm)

Available nuts:
d1: M6, M7, M8, 1/4-28UNF, 5/16-24UNF, 3/8-24UNF, M8x1, M10x1



9532	OS-Max-FS60/61, 70, 80, 90/91 (4-Stroke) – OS-Max 61/91 FX (2-Stroke)	5/16“UNF-24	9,5 mm
9537	Saito, FA 45, FA 50, FA 56, FA 65, FA 72, FA 80 (4-Stroke)	M6	8,0 mm
9539	Enya 60-4C, 80-4C (4-Stroke)	M7	7/9,5 mm
9540	OS-Max-FS120 (4-Stroke), – OS-Max-90/91, 104RX, 140 RX (2-Stroke) Magnum XL-70AR, XL-80AR, XL-90/91AR, XL-120AR, XL-180AR (4-Stroke)	5/16“UNF-24	10,0 mm
9541	Webra-Speed 91, 120 Aero (2-Stroke) – Saito FA 90/91, 100, 120, 150, 180, 220 (4-Stroke)	M8	10,0 mm
9543	OS-Max FS 40, FS 48, FS 52 Laser 70 (4-Stroke)	1/4“UNF-28	8/6,3 mm
9545	Enya 46-4C, 53-4C (4-Stroke)	1/4“UNF-28	6,3/8,0 mm
9546	Enya 90-4C (4-Stroke)	M7/28	7,0/9,5 mm
9548	Magnum XL108A, XL120A, OS-Max 108 FSR (2-Stroke)	3/8“UNF-24	10,0 mm
9549	Enya 120-4C (4Stroke)	M8 x 1	8,0/12 mm
9550	MVVS-26 (Glow)	M10 x 1	10,0 mm

The engines: Magnum, ASP and SC are identical.

Additionally required parts that are not included in the kit:
1 plug heater, stock number 9593B
1 starter storage battery 9.6 Volt, min 1.0 Ah for engines up to 18 cc
1 starter storage battery 10.8-12 Volt, min 1.0 Ah for engines over 18cc

www.fema-modelltechnik.de · e-mail: FemaModelltechnik@gmx.de

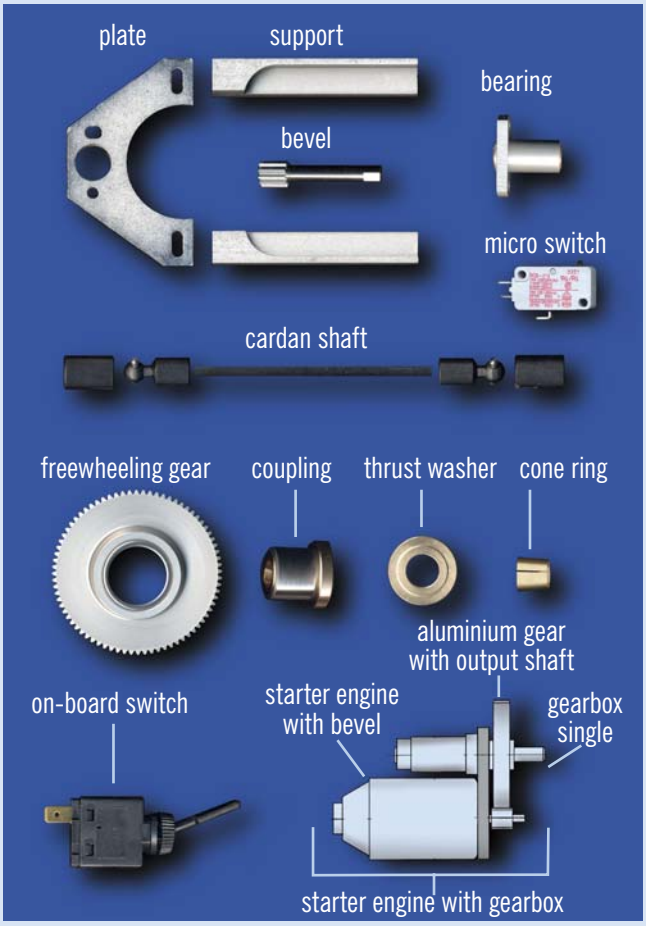
Universal on-board starter

FEMA

Spare parts for	9500	9512	9514
Support, 2 units	9500/01	9512/01	9512/01
Plate	9500/02	9512/02	9514/01
Bearing	9500/03	9500/03	9500/03
Freewheeling gear, 60/76/92 teeth, m=0.8	9500/05	9512/05	9712/04
Bevel, 10 teeth, m=0.8	9500/06	9500/06	9500/06
Coupling	9500/07	9518/07	9712/07
Cardan shaft	9515/07	9515/07	9515/07
Starter engine with gearbox	9580/01*	9570/01*	9572/01*
Gearbox, single	9580/02	9570/02	9570/02
Starter engine with bevel, 12 teeth, m = 0.5	9580/05	9570/05	9575/03
Aluminium gear with output shaft	9580/04	9570/04	9570/04
Bevel for starter engine, 12 teeth, m = 0.5	9570/03	9570/03	9570/03
Micro switch, single	9560/04	9560/04	9560/04
Board switch, 16A	9560/07	9560/07	9560/07
Small parts kit (not shown)	9500/12	9512/12	9514/12
Thrust washer			9530/35
Clamping ring			9530/26

* Dimensional drawings see page 14

Spare parts for 9500, 9512, 9514



Dimensional drawing: basic kit, stock number 9500/ 9512/ 9514

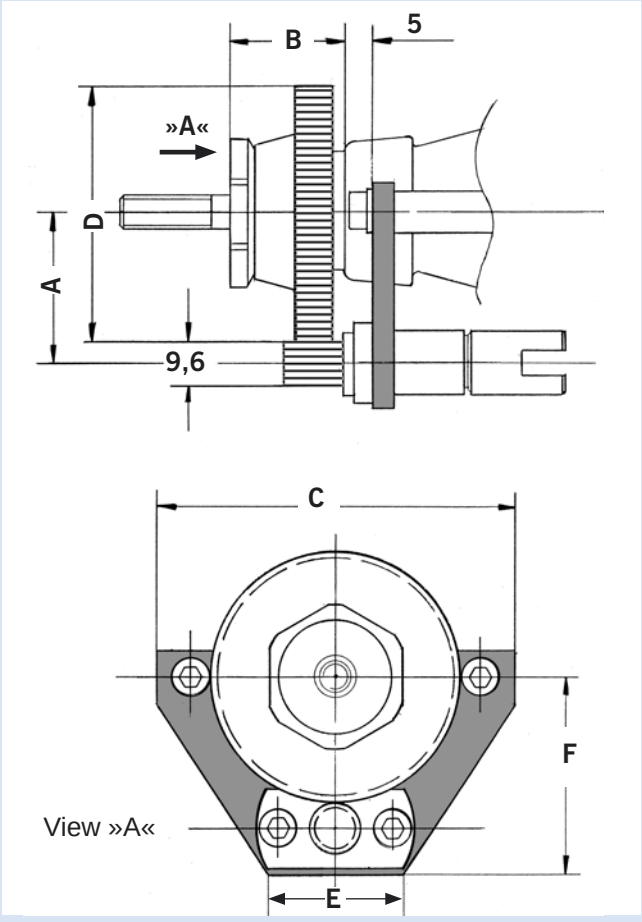
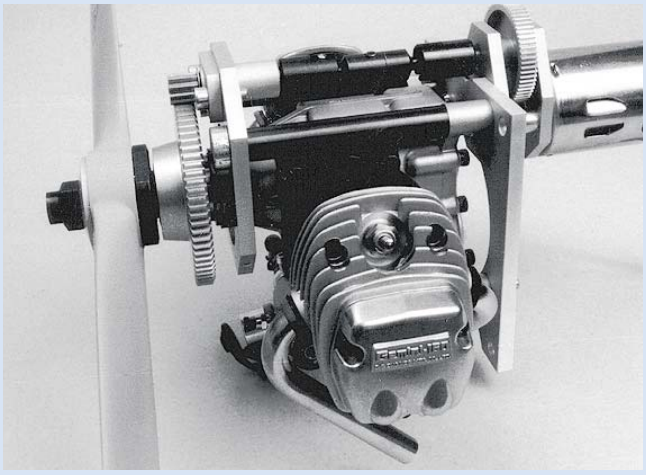


Table with dimensions (dimensions in mm) / weight (without starter storage battery)

type	A	B	C	D	E	F	weight
9500	29,0	24,0	68,0	48,0	25,0	37,0	320 gr.
9512	35,0	24,0	76,0	60,8	25,0	40,0	380 gr.
9514	42,0	26,0	90,0	73,6	30,0	50,0	440 gr.

Universal on-board starter

FEMA



Stock number 9710 **Compact on-board starter for OS-Max FT 120/160**
Stock number 9711 **Compact on-board starter for OS-Max FF 320 »Pegasus«**
Stock number 9732 **Compact on-board starter for Saito FG-57T**

The on-board starters for flat engines are designed as compact on-board starters. The kit contains all mechanical components as well as the starter engine with all-metal gearbox and all electric components that are necessary for the assembly of the on-board starter in the model.

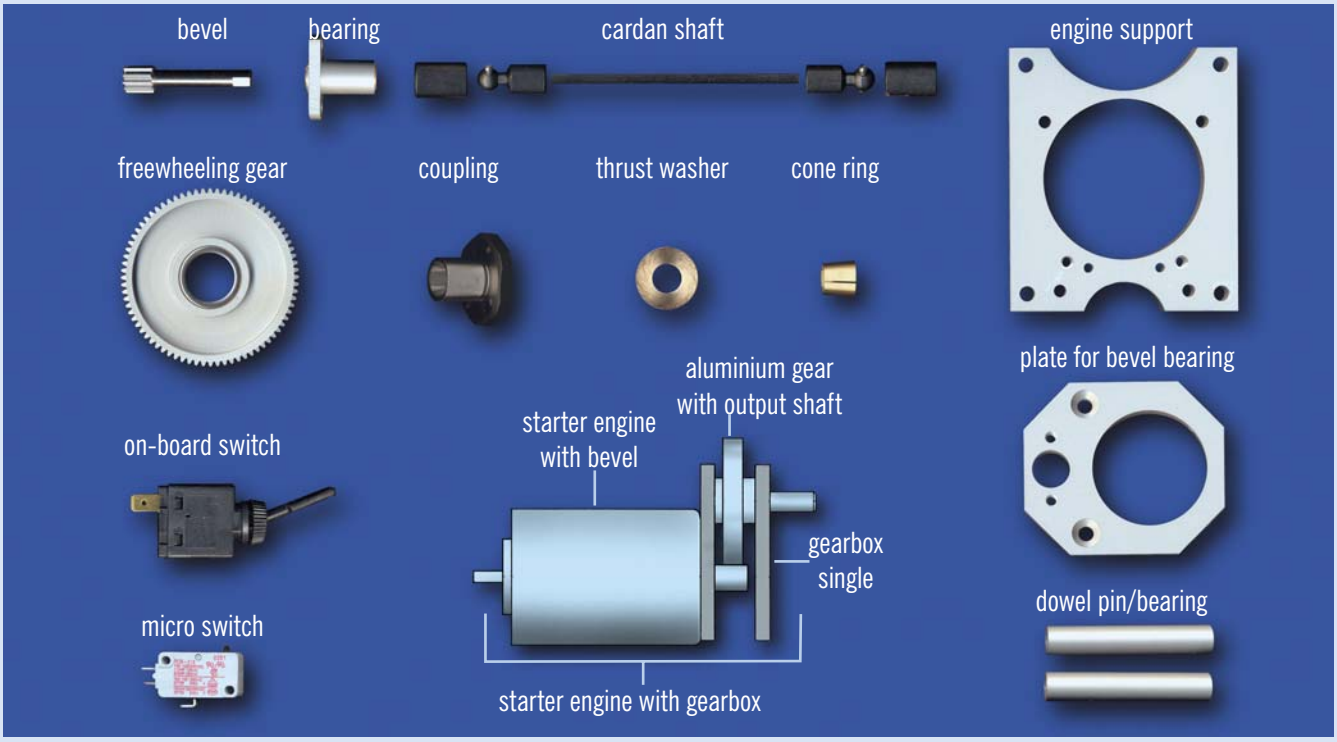
Spare parts for 9710, 9711, 9732

For the operation of the glows plug you need an additional »Glow Control« which is not included in the kit.

Stock number 9593B for OS-Max FT-120/160 Gemini
Stock number 9594B for OS Max FF-320 Pegasus

If you use the ***»Glow Control«*** you only require one storage battery for the operation of the on-board starter from which the starter engine and the glow plug are fed.
Saito FG-57 comes standard with an ignition system.

Additionally required products that are not included in the kit:
1 starter storage battery 9.6 – 12 Volt, min. 1.0 Ah for stock numbers 9710, 9711
1 starter storage battery 10.8 – 12 Volt, min. 1.0 Ah for stock number 9732



www.fema-modelltechnik.de · e-mail: FemaModelltechnik@gmx.de

Universal on-board starter

FEMA

Spare parts for	9710	9711	9712
Thrust washer	9530/33	9530/33	9530/35
Clamping ring	9530/23	9530/23	9530/26
Plate for bevel bearing	9518/03	9711/01	9712/02
Engine support plate	9710/01	9710/01	
Carrier for electric motor (not shown)			9712/05
Al/bolt/bearing, 2 units	9518/05		9712/03
Freewheeling gear 76/92 teeth, m=0.8	9512/05	9512/05	9712/04
Coupling	9518/07	9518/07	9712/07
Bearing	9500/03	9500/03	9500/03
Bevel 10 teeth, m=0.8	9500/06	9500/06	9500/06
Cardan shaft	9515/07	9515/07	9515/07
Starter engine with gearbox	9580/01*	9572/01*	9572/01*
Gearbox single	9580/02	9570/02	9570/02
Starter engine with bevel, 12 teeth, m=0.5	9580/05	9575/03	9575/03
Aluminium gear with output shaft	9580/04	9570/04	9570/04
Micro switch, single	9560/04	9560/04	9560/04
On-board switch, 16A	9560/07	9560/07	9560/07
Small parts kit (not shown)	9710/12	9711/12	9712/12

*Dimensional drawings see page 14

Dimensional drawings: 9710 / 9711 / 9712 / 9720

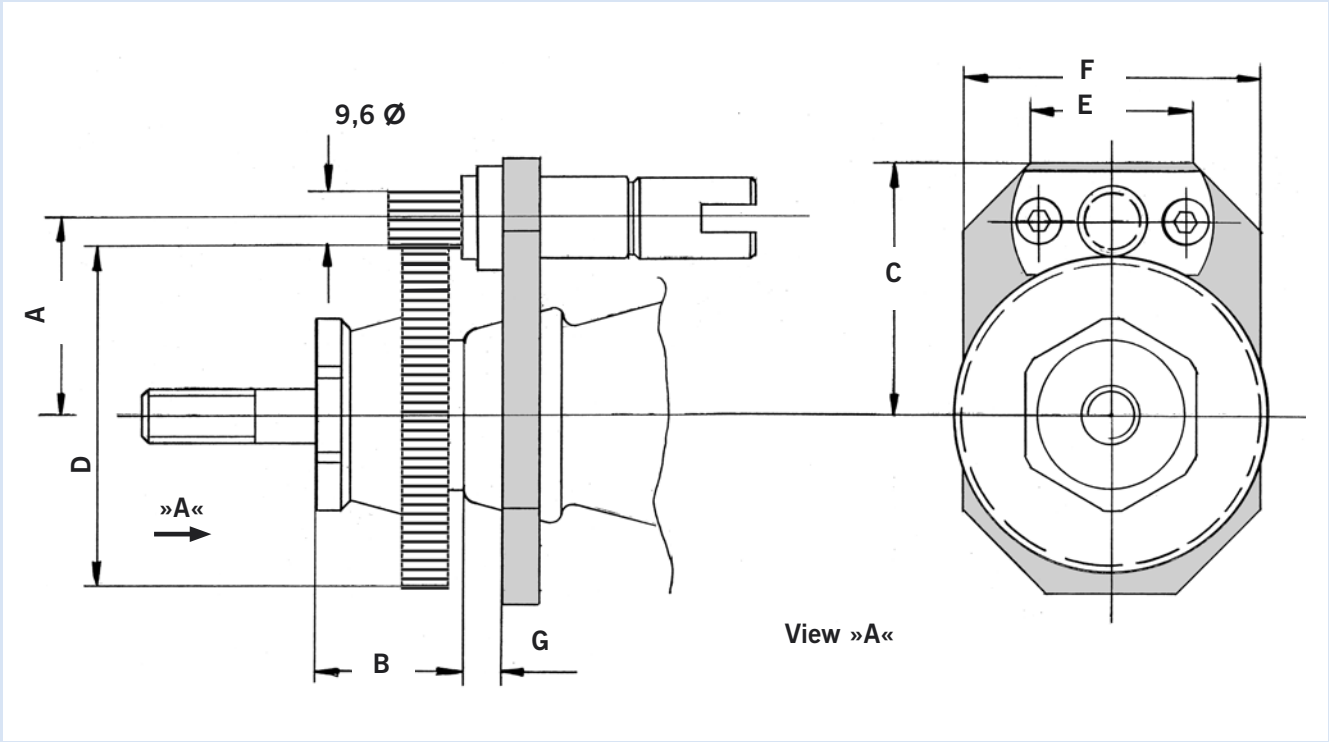


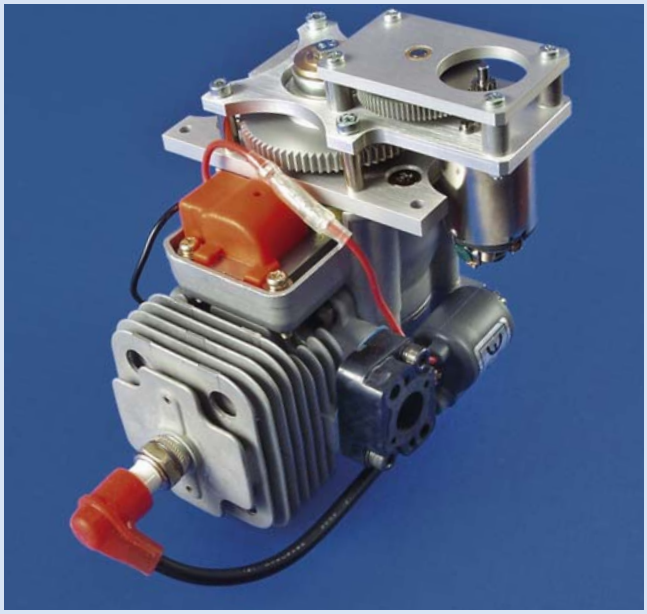
Table with dimensions (dimensions in mm) / weight (without starter storage battery)

Type	A	B	C	D	E	F	G	Weight
9710	35,0	24,0	44,0	60,8	28,0	60,0	8,0	400 gr.
9711	35,0	24,0	44,0	60,8	28,0	60,0	8,0	450 gr.
9712	42,0	26,0	50,0	73,6	35,0	70,0	16,0	500 gr.

Compact on-board starter

FEMA

Stock number 9400A Compact on-board starter for:
Zenoah G 230/260/270 RC



Stock number 9420A Compact on board starter for:
Titan ZG 23/26, ZG 231/260,
Zenoah G 230/260 PU, G 231/260 PUH

These on-board starters were developed especially for the use in ZENOAH engines with a cubic capacity of 20-29 cm^2 and are universally suitable for park-flyers, helicopter, car and ship models.
The on-board starters are designed as compact on-board starters, i.e. the starting device and the starter engine are mounted directly to the internal combustion engine. Thus the internal combustion engine and the on-board starter form a very compact unit.
The complete driving unit can also be easily attached to vibration absorbing elements in the model. The choice for the best suited on-board starter for your model simply depends on your combustion engine and the available space in your model.

● **Stock number 9400A** Fits in all helicopters produced by Vario and AeroTec as well as for all helicopter and car models if there is enough space in your model.

● **Stock numbers 9420A, 9421A, 9713A, 9714 and 9715A** Designed for the universal usage in park-flyers, helicopter and car models.

● **Stock number 9613A** A special design for the use in ship models.

Functionality:
The mechanical construction of the on-board starters is similar for all models. The power is transmitted from the starter engine to the crank shaft of the internal combustion engine via the gear reduction with integrated free-wheel. When the internal combustion engine is running the free-wheel separates the combustion engine from the on-board starter.

Assembly kits:
The kits contain all mechanical components as well as the starter engine with metal gearbox and all electric components required for the integration of the on-board starter into the model.
The starter storage battery is not included in the kit.

Stock number 9412A Compact on-board starter for:
Titan ZG 20,
Zenoah G 200 PU

www.fema-modelltechnik.de · e-mail: FemaModelltechnik@gmx.de

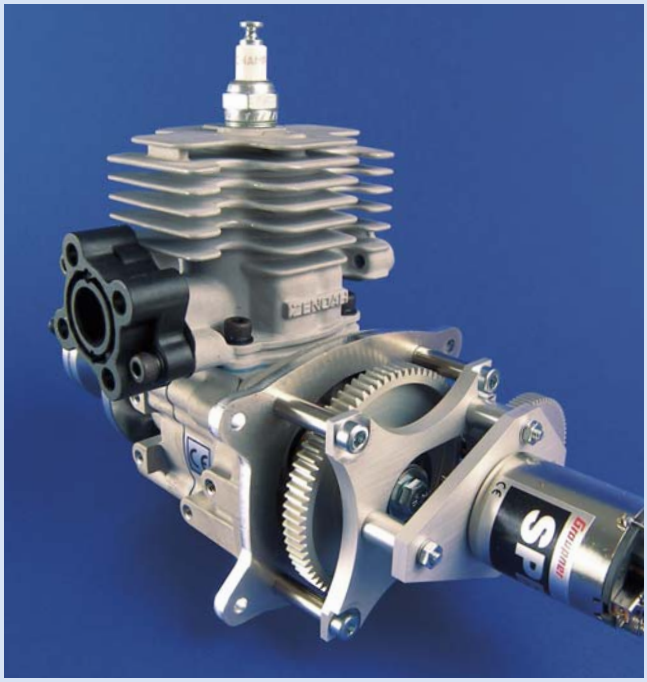
Compact on-board starter

FEMA

Stock number 9713A Compact on-board starter for:
Titan ZG 23/26, ZG 231/260 Heli,
Zenoah G 230/260 PU, G 231/260 PUH

Note:
The compact on-board starters with stock number 9400A, 9421A, 9713A, 9715A and 9613A can be attached directly to the standard engine support plate of the engine. The engine support plate contains all threads that are required for the assembly. If you use a combustion engine without engine support plate you can order it here (see spare parts list).

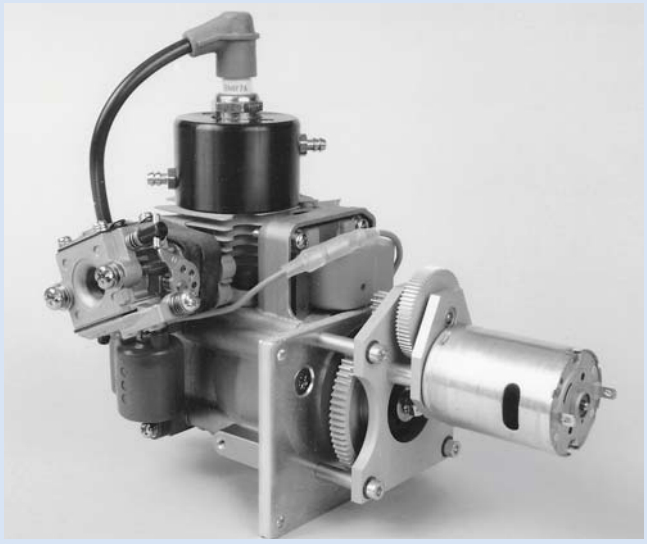
Stock number 9714 Compact on-board starter for:
Titan ZG 38,
Zenoah G 380 PU



Stock number 9715A Compact on-board starter for:
Titan ZG 20,
Zenoah G 200 PU

The engine support plate is included in the kit for the compact on-board starters with stock number 9420A and 9714.

Additionally required parts that are not included in the kit:
1 starter storage battery, 9.6-10.8 Volt, min. 1.0 Ah for: 9400A, 9420A, 9421A, 9713A, 9715A.
1 starter storage battery, 10.8-15 Volt, min. 1.0 Ah for: 9613A and 9714



Stock number 9613A Compact on-board starter for:
Titan ZG 23/26 Marine,
Zenoah G 230/260 PUM

Compact on-board starter

FEMA

Spare parts for	9400A	9420A	9421A	9613A	9713A	9714	9715A
Engine support plate		9420/08	9715/08*	9420/08*	9420/08*	9520/01	9715/08*
Thrust washer			9530/32			9530/33	9530/32
Holder disc	9400/10	9400/10	9400/10	9400/10	9400/10	9500/07	9400/10
Coupling	9400/11	9400/11	9400/11	9400/11	9400/11		9400/11
Freewheeling gear, 76 teeth, m = 0.8mm	9400/12	9420/12	9420/12	9410/12	9410/12	9512/05	9410/12
Gearbox support with bevel, 10 teeth and aluminium gear	9400/16	9420/16	9420/16	9713/02	9715/02	9714/02	9715/02
Carrier for electric motor	9400/15	9420/15	9420/15	9713/04	9715/04	9714/04	9715/04
Starter engine with bevel	9400/04	9420/04	9420/04	9575/03	9580/05	9575/03	9580/05
Small parts kit	9400/07	9420/07	9421/07	9613/12	9713/12	9714/07	9715/07
Fan wheel with reconditioning	9400/08						
Nut M8x1 left						9520/02	
Clamping ring						9530/24	
Micro switch, 16A	9560/04 suitable for all on-board starters						
On-board switch, 16A	9560/07 suitable for all on-board starters						
2 core cable 1.6 mm	9560/08 suitable for all on-board starters						
Weight without starter storage battery in g.	375	375	375	450	375	450	375

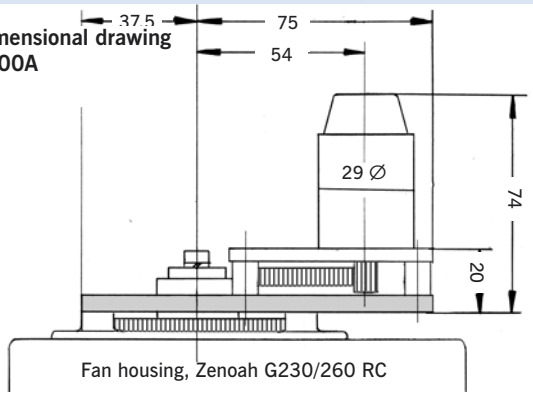
*not included in the kit

www.fema-modelltechnik.de · e-mail: FemaModelltechnik@gmx.de

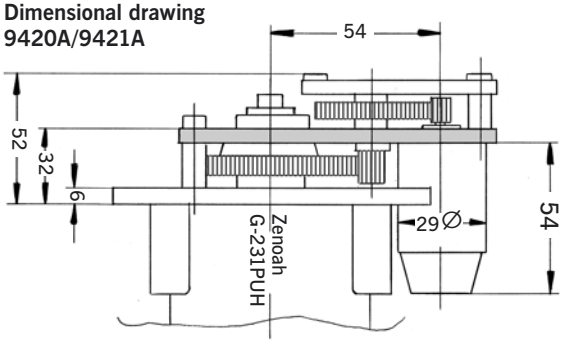
Compact on-board starter

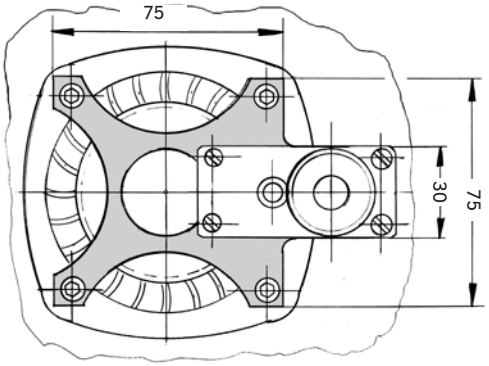
FEMA

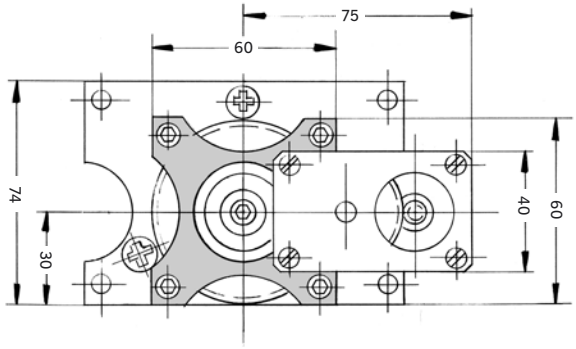
Dimensional drawing 9400A



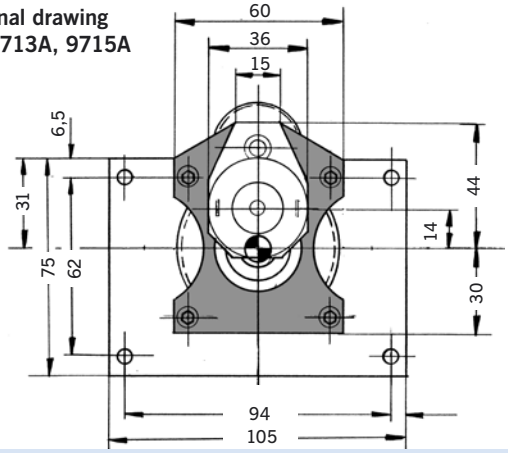
Dimensional drawing 9420A/9421A

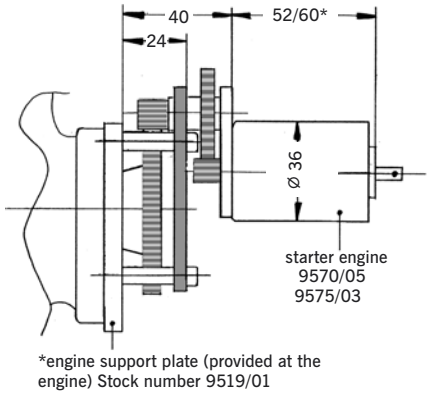






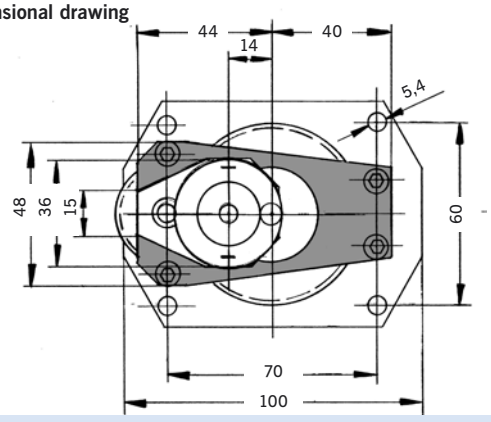
Dimensional drawing 9613A, 9713A, 9715A

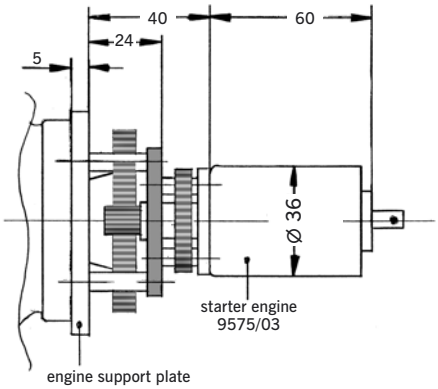




*engine support plate (provided at the engine) Stock number 9519/01

Dimensional drawing 9714





NEW!

Compact on-board starter

FEMA

Stock number 9724
Compact on-board starter for Titan ZG-62, Zenoah G62
Stock number 9725
Compact on-board starter for Titan ZG-45, Zenoah G45
Stock number 9730A
Compact on-board starter for Zenoah/Titan ZG-74/80

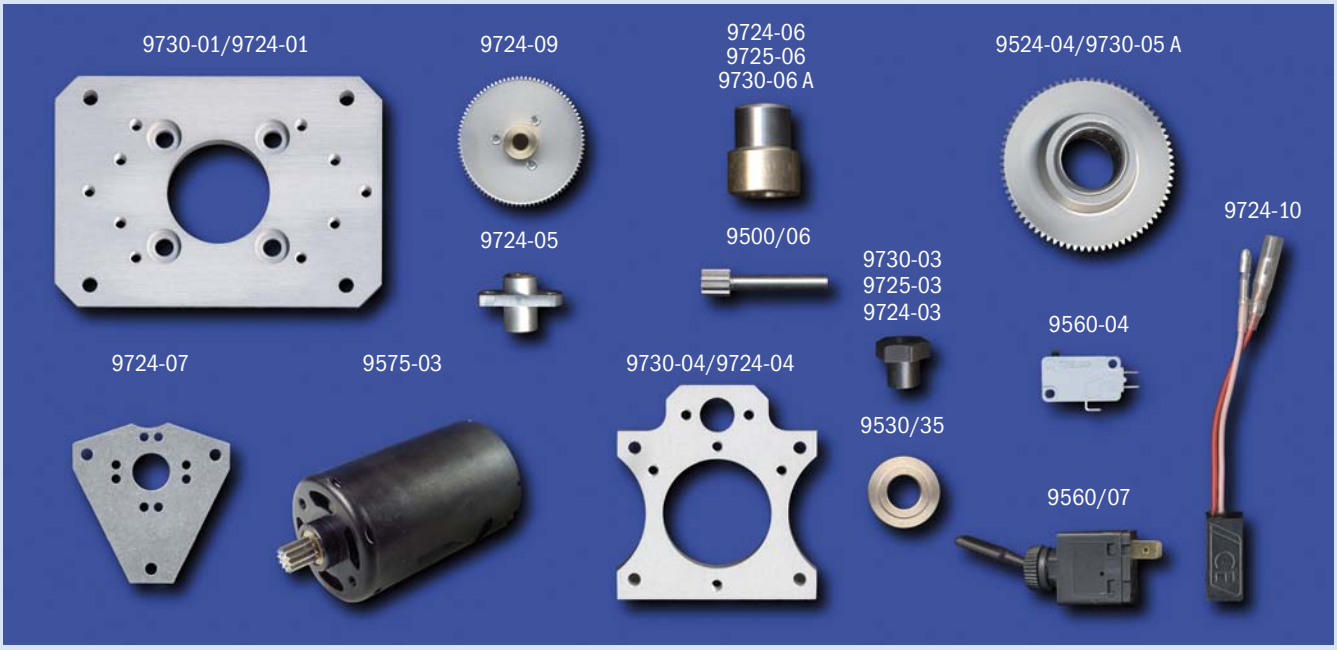
These on-board starters are designed as compact on-board starters, i.e. the starting device and the starter engine are mounted directly to the internal combustion engine. Thus the internal combustion engine and the on-board starter form a compact unit. The kit contains all mechanical components as well as the starter engine with metal gearbox and all electric components required for the integration of the on-board starter into the model. The FEMA engine support plate for ZG 45/62 and the engine support for ZG-74/80 are also included in the kit.

The engine support for ZG-74/80 has the same dimensions and fixing holes as the standard engine support made from sheet steel.
It is also possible to assemble the ZG-62/45 in connection with the »Hydro-Mount-System Pitts« of the company Toni Clark. You can order the engine support plate with stock number 9724-02 directly from us.

To eliminate the risk of kickback for the engines of type Titan and Zenoah with magneto ignition we recommend to equip the engines with a micro processor ignition unit PCI of the company »www.toni-clark.com«.

This modification is mandatory for the operation of Titan/Zenoah ZG-74/80.

Spare parts 9724, 9725, 9730A

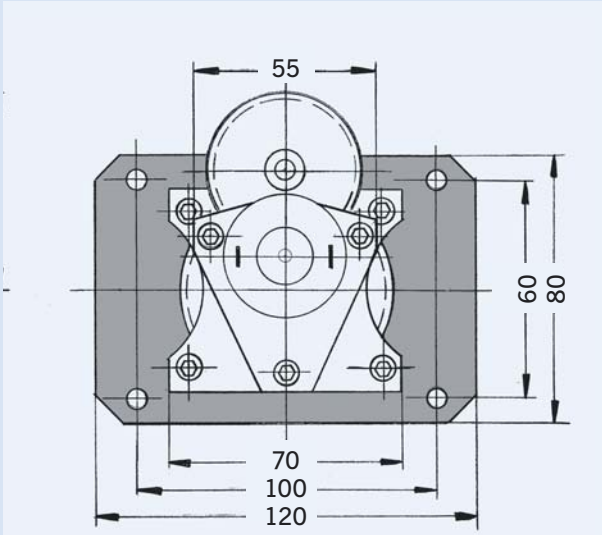


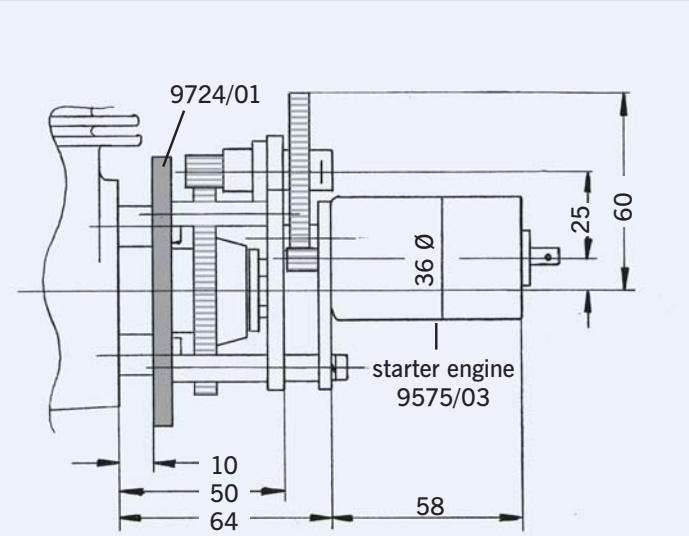
Compact on-board starter

FEMA

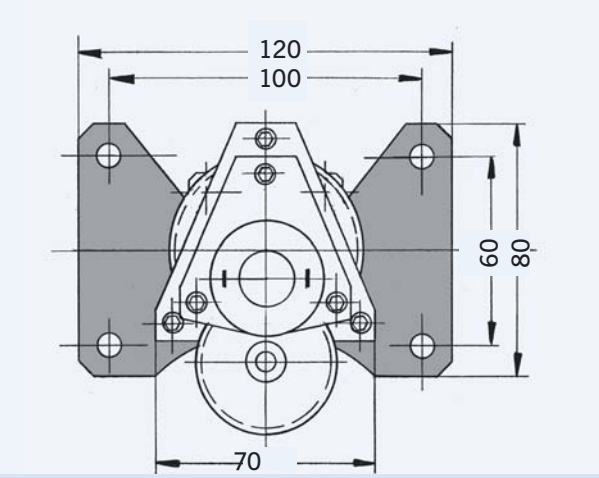
Spare parts for	9724	9725	9730 A
Engine support plate/support*	9724/01	9724/01	9730/01*
Engine support »Hydro-Mount-System Pitts«	9724-02	9724-02	-
Coupling	9724/06	9725/06	9730/06 A
Freewheeling gear, 76 teeth, m = 0.8	9524/04	9524/04	9730/05 A
Thrust washer	9530-35	9530-35	9530-35
Nut M10x1 / M8x1	9724/03	9725/03	9730/03
Bevel support plate	9724/04	9724/04	9730/04
Bevel bearing	9724/05	9724/05	9724/05
Bevel 10 teeth	9500/06	9500/06	9500/06
Aluminium gear with 90 teeth, m = 0.5	9724/09	9724/09	9724/09
Carrier for electric motor	9724/07	9724/07	9724/07
Starter engine Speed 600, with bevel 12 teeth	9575/03	9575/03	9575/03
Micro switch, 16A	9560/04	9560/04	9560/04
On-board switch, 16A	9560/07	9560/07	9560/07
Electronics	9724/10	9724/10	9724/10
Small parts kit (not shown)	9724/12	9725/12	9730-12

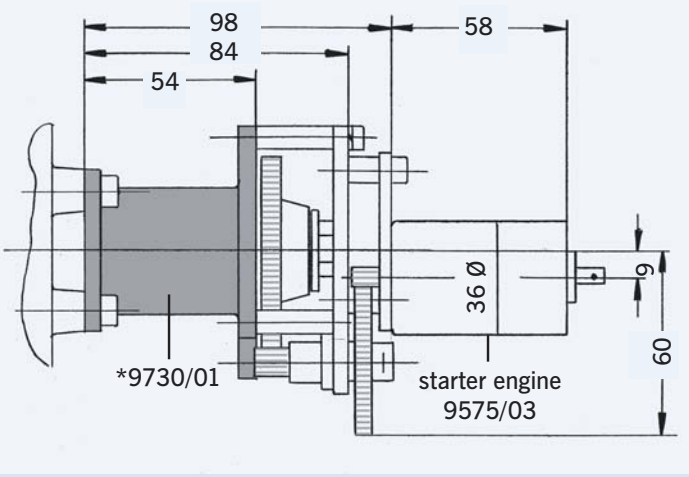
Dimensional drawing 9724, 9725 / weight (without engine support and starter storage battery) ca. 500 gr.





Dimensional drawing 9730 / weight (without engine support and starter storage battery) ca. 500 gr.





Additionally required parts that are not included in the kit: 1 starter storage battery 10.8-15 Volt, min 1.0 Ah.

Accessories for on-board starters

Stock number 9592B Glow Control for 1 glow plug
Stock number 9593B Glow Control for 1-2 glow plugs
Stock number 9594B Glow Control for 1-4 glow plugs

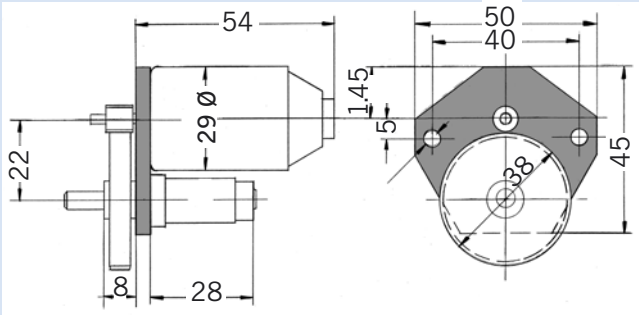
The plug warmer ***GlowControl 1-2 OAS by rainbow-tronic*** is designed to start the engine on ground and in the air and provides a proper operation of the engine in a slow speed range. The plug warmer is simply connected via a Y-cable or a free receiver channel parallel to the gas servo.

The power of the ***»Glow-Control«*** is supplied via the starter storage battery. The operation of the on-board starter therefore requires only one storage battery.

The function of the ***»Glow-Control«*** is based on the latest microprocessor technology in industrial quality and is designed for the deployment in methanol engines with 1, 2 or 4 cylinders with on-board starting systems.

Technical data
Input supply voltage: 8.4 – 12 Volt
Plug voltage: 1.4 – 2.0 Volt

Dimensional drawing:
Starter engine with gearbox Stock number 9580-01



Dimensional drawing:
Starter engine with gearbox Stock number 9570-01 and 9572/01